

Waters

MANUFACTURING, INC.

BOSTON POST ROAD • WAYLAND, MASSACHUSETTS

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Wayland, Massachusetts

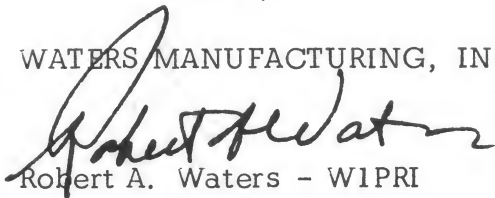
Dear O. M.

Here is your personal copy of
our new Amateur Equipment catalog.

We also enclose an up-to-date
list of our Distributors, any one of
whom will be glad to fill your orders.

73,

WATERS MANUFACTURING, INC.

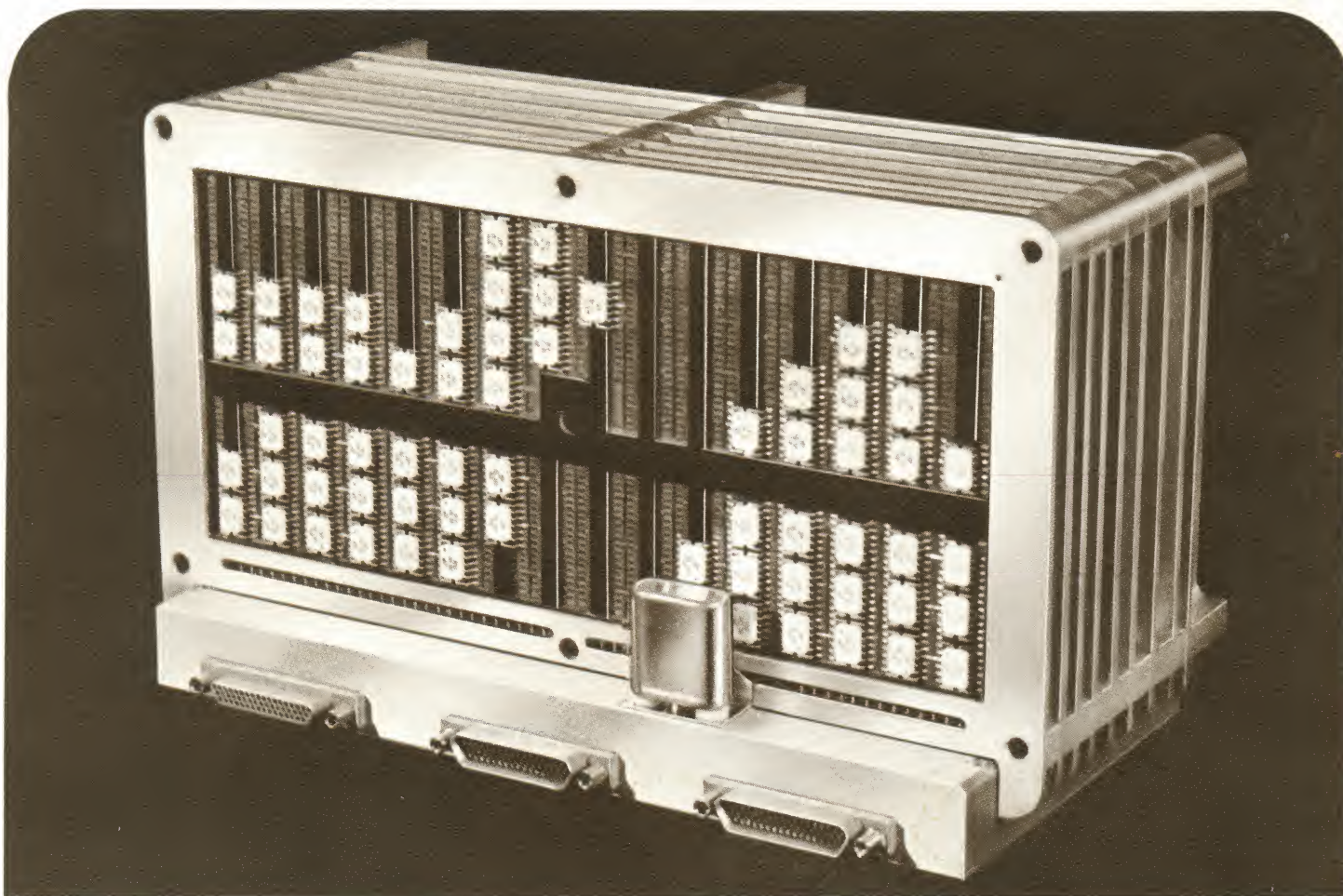


Robert A. Waters - WIPRI
President





ARMA MICRO-D Advanced Computer



Specifications

Organization:	Serial	Power Requirements at 100 kc:	17 watts**
Number System:	Binary, fixed point, fractional	Environmental Capabilities:	
Negative Numbers:	Two's complement	LOCO has been designed to meet all the standard airborne environments together with the following requirements:	
Word Length:	13 bits (expandable)	Mechanical Environment:	
Clock Frequency:	100 kc to 1.5 mc	Vibration, Operative	10g rms, 0.1g ² /cps; 5-2,000 cps
Operation Times at 1.5 mc (Partial Listing):		Shock, Non-Operative	25g's pk, 11 m sec.
Instruction Add	12 microseconds	Acceleration, Sustained	50g's
Transfer (or branch)	12 microseconds	Atmospheric Environment:	
Store	12 microseconds	Temperature, Operative	-55° to +125° C
Shift	12 microseconds/bit	Temperature, Non-Operative	-62° to +125° C
Multiply	168 microseconds	Humidity	100% at 50° C
Input/Output	12 microseconds	Atmospheric Pressure	Vacuum
Memory:		*Available Options:	
Type	Ferrite Core	(1) Fixed wired NDRO program	
*Program Storage	1920 words (expandable)	(2) DRO electrically programmable	
Scratch Pad capacity	128 words DRO — expandable	(3) Dual capability of (1) plus (2)	
Weight:	4 lbs.**	**With 2048 word memory but less power supply.	
Size:	120 cu. in.**		

Arma is manufacturing an advanced low-cost miniaturized digital computer featuring:

- Functional Simplicity
- Small Size — 1/10 cu. ft.; 4 lbs.
- NDRO/DRO Core Memory
- Monolithic Integrated Circuits
- High Reliability

MICRO D is the outgrowth of a dozen years of Arma experience in the development and production of advanced digital computers for navigation and control applications ranging from intercontinental ballistic missiles to safety monitoring on submarines. Development work was completed on the Micro D in 1966 and three prototypes have been delivered for use in carrier aircraft navigation system alignment. Arma's computer technology — research, engineering, manufacturing, field service — has been proven on such military programs as B-52 fire control, Atlas and MMRBM guidance, F-111B Master Reference System, and the Submarine Safety Monitoring System.

Arma's MICRO D features design simplicity and versatility that makes it ideal for a variety of shipboard, aircraft and missile applications. Its modular construction and functional organization permit ready expansion for use as a systems checkout device and on-board data monitoring and display control.

A unique memory design combines the reliability of an NDRO wired program with the simplicity and efficiency of coincident current selection circuitry common to program and scratch pad storage. In addition, the entire memory may be operated in a standard DRO mode utilizing externally loaded programs.

LOGIC CIRCUITS

TTL monolithic integrated circuits used in MICRO D offer many significant advantages:

- High speed at low power
- High noise immunity
- Only one DC voltage required
- High fan-out and fan-in
- Excellent load driving capability

RELIABILITY

A Mean Time Between Failure of over 20,000 hours** is predicted for MICRO D. This is achieved through

- Optimized computer organization to reduce parts count.
- Reliability and Quality Control techniques and procedures developed in Arma's computer programs.
- Use of qualified high-reliability monolithic integrated circuits for logic and memory.

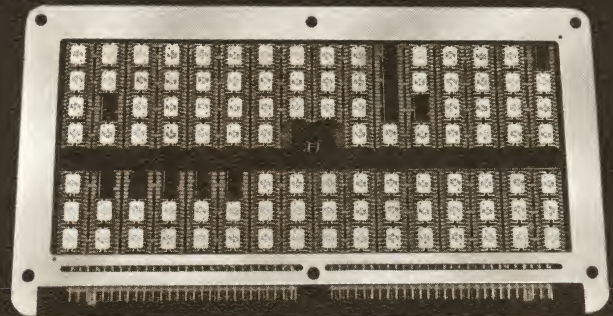
APPLICATION-ORIENTED OPTIONS

In addition to the inherent growth aspects embodied in the computer design, the modular nature of Micro D permits user choice of ...

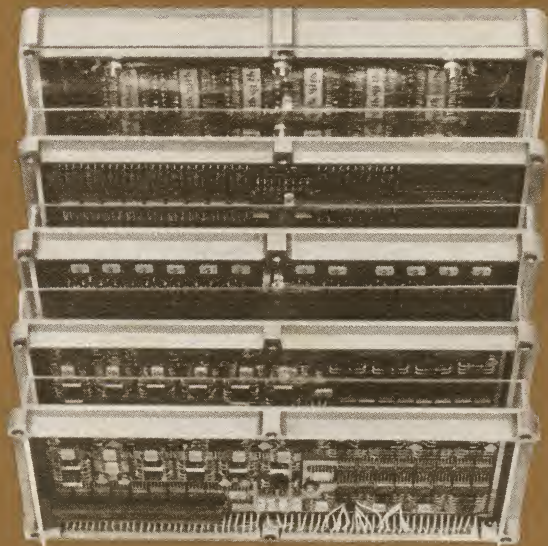
- Memory Capacity
- Prime Power
- Word Length
- Clock Rates
- Input and Output channels such as analog, serial or parallel digital, momentary and latching discretes.

COMPUTER SOFTWARE

An assembly program, simulation program and sub-routine library are available to facilitate the preparation and check-out of new programs for any specific application. In addition, extensive test programs enhance computer maintainability.



Typical Logic Card



Memory Stack and Electronics

Arma Computer Program Milestones

- | | |
|-----------|--|
| 1966 | Completed development of Micro D computer and delivery of three production prototype units for aircraft navigation system alignment. |
| 1965 | Delivered Micro computers for Navy Submarine Safety Monitor System. |
| 1963 | Delivered first flyable MMRBM computer. |
| 1962 | Completed development of Micro computer. |
| 1960-1961 | Programmable airborne computer using miniature components and solid-state NDRO memory designed and developed. |
| 1958-1959 | First all silicon semiconductor digital computer for ICBM applications, designed and developed. |
| 1957-1960 | Computer proven in rocket sled and ICBM flight tests. |
| 1955-1957 | First airborne all solid-state digital computer developed and delivered. |
| 1951-1954 | Pioneered in digital techniques which were later selected for the inertial guidance system of the Atlas ICBM. |
| 1946-1953 | Advanced submarine and airborne analog computers designed and delivered in production quantities. |
| 1939 | First submarine fire control computer designed and produced. |

A diversified electronics systems engineering and manufacturing organization, Arma is active in four prime technical areas — Navigation and Guidance, Ground Support and Test Equipment, Naval Systems, and Space Electronics. The division also is developing products in the fields of sonics, data management, and computers.

The Division has delivered over \$2 billion worth of weapons systems and accessories to the military services. Its first products were shipboard searchlights, compasses and stable elements. Its capabilities were expanded to include Navy fire control systems and subsequently the airborne fire control systems. It was Arma that developed the first inertial navigation system capable of intercontinental range — the system that is in use on all E and F series Atlas ICBM's.

Arma Division occupies a modern single story plant covering 130,000 square feet of offices, laboratories, clean assembly areas, and factory facilities, with a staff of 900 employees.

Arma's background in fire control systems for surface ships, submarines and aircraft, and terrestrial guidance and electronic systems represents a rich heritage of talent and research experience in system concepts and component requirements. Applied against the dynamic needs and trends in the 1960's, this experience is a valuable asset in Arma's position as an important design and engineering facility for electronic systems and associated support equipment.

ARMA DIVISION OF AMERICAN BOSCH ARMA CORPORATION

GARDEN CITY, N. Y. 11530...TEL: 516-742-2000

AMERICAN BOSCH ARMA CORPORATION

ARMA

ARMA DIVISION

GARDEN CITY
NEW YORK

Pioneer 2-2000

18 May 1967

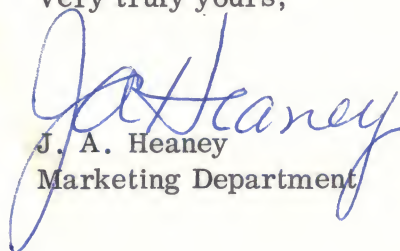
Thank you, Mr. Nelson,

. . . . for your inquiry about Arma's MICRO-D Computer. A brochure describing that versatile low-cost system is enclosed.

MICRO-D has been selected by Litton Industries for use in its LTN-51 navigation system for commercial aircraft. It is in production for the master reference system of the F11B aircraft and will be used in the automatic test equipment for the Army's Lance missile.

Any additional information on performance or pricing is as near as your telephone.

Very truly yours,


J. A. Heaney
Marketing Department

JAH:pc
Enc.

Mr. T. Nelson
Systems Consultant
P. O. Box 1546
Poughkeepsie, New York 12603